

CLAIMS

1 1. An antenna structure comprising:
2
3 at least one antenna element, the at least one antenna element having at
4 least one taper; and
5
6 a symmetrical ground plane coupled with the at least one antenna
7 element.

1 2. The antenna structure of Claim 1, wherein the at least one antenna
2 element comprises a travelling wave antenna supporting a phase velocity
3 greater than the speed of light.

1 3. The antenna structure of Claim 1, wherein the taper comprises a linear
2 profile, a linear constant profile, a broken-linear profile, an exponential profile,
3 an exponential constant profile, a tangential profile, a step-constant profile, or a
4 parabolic profile.

1 4. The antenna structure of Claim 1, wherein the antenna structure supports
2 a cigar-like directional three-dimensional beam pattern and a butterfly wing-
3 like directional three-dimensional beam pattern.

1 5. The antenna structure of Claim 1, wherein the at least one antenna
2 element is positioned at an angle from the symmetrical ground plane.

1 6. The antenna structure of Claim 5, wherein the angle is about 90 degree
2 with respect to the x-, y- and z- axes.

1 7. The antenna structure of Claim 1, wherein the at least one antenna
2 element is coupled with the symmetrical ground plane by means of an
3 unbalanced impedance.

1 8. The antenna structure of Claim 7, wherein the unbalanced impedance
2 comprises a coaxial cable.

1 9. The antenna structure of Claim 7, wherein a first conductor of the
2 unbalanced impedance mechanically couples the at least one antenna element
3 with the symmetrical ground plane.

1 10. The antenna structure of Claim 1, wherein the symmetrical ground plane
2 is disk shaped.

1 **11.** An antenna structure comprising:

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3 an array of at least two antenna elements, each antenna element having
4 at least one taper;

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6 a symmetrical ground plane; and

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8 an unbalanced impedance for coupling the array of at least two antenna
9 elements with the symmetrical ground plane.

1 **12.** The antenna structure of Claim 11, wherein at least one antenna element
2 of the array comprises a travelling wave antenna supporting a phase velocity
3 greater than the speed of light.

1 **13.** The antenna structure of Claim 11, wherein the taper of at least one
2 antenna element of the array comprises a linear profile, a linear constant
3 profile, a broken-linear profile, an exponential profile, an exponential constant
4 profile, a tangential profile, a step-constant profile, or a parabolic profile.

1 **14.** The antenna structure of Claim 11, wherein each antenna element of the
2 array supports a cigar-like directional three-dimensional beam pattern and a
3 butterfly wing-like directional three-dimensional beam pattern.

1 15. The antenna structure of Claim 11, wherein each antenna element of the
2 array is positioned at an angle from the symmetrical ground plane.

1 16. The antenna structure of Claim 15, wherein the angle for each antenna
2 element is about 90 degree with respect to the x-, y- and z- axes.

1 17. The antenna structure of Claim 11, wherein the unbalanced impedance
2 comprises a coaxial cable.

1 18. The antenna structure of Claim 17, wherein a first conductor of the
2 unbalanced impedance mechanically couples each antenna element of the array
3 with the symmetrical ground plane.

1 19. The antenna structure of Claim 11, wherein the symmetrical ground
2 plane is disk shaped.

1 20. The antenna structure of Claim 11, further comprising a slow wave
2 antenna to widen the directivity of the antenna structure.

1 **21.** An apparatus comprising:

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3 a transceiver; and

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5 an antenna structure for radiating or capturing electromagnetic energy
6 from or to the transceiver comprising:

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8 at least one antenna element having at least one taper, the taper
9 comprising a linear profile, a linear constant profile, a broken-
10 linear profile, an exponential profile, an exponential constant
11 profile, a tangential profile, a step-constant profile, or a parabolic
12 profile;

13

14 a symmetrical disk shaped ground plane, the at least one antenna
15 element being positioned at an angle from the symmetrical disk
16 shaped ground plane; and

17

18 an unbalanced impedance for coupling the at least one antenna
19 element with the symmetrical disk shaped ground plane.

1 **22.** The apparatus of Claim 21, wherein the at least one antenna element
2 supports a cigar-like directional three-dimensional beam pattern and a butterfly
3 wing-like directional three- dimensional beam pattern.

1 **23.** The antenna structure of Claim 21, wherein the angle is about 90 degree
2 with respect to the x-, y- and z- axes.

1 24. The antenna structure of Claim 21, wherein the unbalanced impedance
2 comprises a coaxial cable.

1 25. The antenna structure of Claim 21, wherein a first conductor of the
2 unbalanced impedance mechanically couples the at least one antenna element
3 with the symmetrical ground plane.

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